# Sediment toxicity testing

# Sediment matrices

- Sediment collection
  - Grab samplers
    - Ponar
    - Eckman grab
    - Core samplers
    - Scoop
  - Interstitial water / pore water
    - Aqueous toxicity testing
    - Chemical analysis

# Sediment toxicity

- Toxicity testing
  - upper 3 cm of water/sediment interphase
  - Control / reference sediment
    - Essentially free of contaminants, not necessarily collected near study site
- 10-d acute test endpoints
  - Survival
  - Growth
  - Biomass (dry weight/original # organisms)

# Sediment toxicity

- *Chironomus dilutus (tentans)*
  - 3rd instar development stage
  - Sediment burrowers – upper 10 cm
  - Sediment ingestion
- Easily cultured in laboratory
- Tolerance to overlying water conditions
- Short generation time
- Response evaluated with interlaboratory testing

# *C. dilutus*

- Life stages
  - Egg stage
  - Larval stage
    - 4 instars
  - Pupal stage
  - Adult stage (midge)
- Aquatic during egg, larval and pupal stages

# *C. dilutus*

- 100 ml sediment in 250 ml beaker
- Overlying water renewal – daily x2
- Feeding regime - tetramin® slurry
- Organisms / chamber – 10 – 3rd instar
- Aeration – if needed (DO < 2 mg/L)
- Water quality beginning & end of test
- Replication – 8 recommended (USEPA)

# *Hyalella azteca*

- Epibenthic detritivores
  - Bacteria
  - Algae
- Burrowing amphipod
- Sediment & water exposure

# *Hyalella azteca*


- 100 ml sediment in 250 ml beaker
- Overlying water renewal – daily x2
- Feeding regime – YCT (yeast, cereal, trout chow)
- Organisms / chamber – 10 – 7-10 days old
- Aeration – if needed (DO < 2.5 mg/L)
- Water quality beginning & end of test
- Check daily for sediment avoidance
- Replication – 8 recommended (USEPA)

# *Lumbriculus variegatus*

- Tunnel in upper aerobic sediment
- Undulate for respiratory exchange
- Tolerance to wide variety of water quality
- Easily cultured in laboratory

# *Lumbriculus variegatus*

- Sediment bioaccumulation tests
- 4-6 L aquarium
- 1 L sediment
- At least 1 L overlying water
  - Renewed 2x daily
- No feeding regime
- Test duration – 28 d

- May screen with 4-d preliminary toxicity screening
  - 250 mL beakers
  - Insures tolerance to contaminant for bioaccumulation

# Acute sediment testing

- *C. dilutus* & *H. azteca*
- 10-d duration
- Feeding regime as described
- Endpoints
  - Survival
  - Growth
- Controls ≥ 70% survival
- ANOVA to measure significant differences

# Chronic sediment testing

- 42-d test duration
- Feeding regime as described
- Endpoints
  - Survival & growth at 21-d (Install emergence traps)
  - 21-d to 42-d record emergence of males and females, pupal and adult mortality.
  - Record time to death
  - Transfer emerging adults to reproduction chamber
    - Record egg cases
  - End given treatment with no recorded emergence by sieving and recovery of larvae, pupae or exuviae
- Controls ≥ 70% survival
- ANOVA to measure significant differences

# Chronic sediment testing

- *H. azteca*
- 42-d test duration
- Feeding regime as described
- Endpoints
  - Survival & growth at 28-d
  - Survival & reproduction at 35-d
  - Survival, growth, length, reproduction & male/female ratio at 42-d

# Sediment spiking

- Reference sediment
- Glass beads
- Measure endpoints of known chemicals
- Testing methods as described